

Newark Division of Water

ANNUAL REPORT
OF THE
DIVISION OF WATER
FOR
1933.

ANNUAL REPORT
OF THE
DIVISION OF WATER

Mr. James W. Costello, Chief Engineer
Department of Public Affairs
Newark, New Jersey

Dear Sir:

The annual report of the various Bureaus of the Division of
Water is herewith submitted.

Respectfully,

WGB:FM

WILLIAM G. BANK
DIVISION ENGINEER

ANNUAL REPORT
OF THE
BUREAU OF WATER SUPPLY
(DIVISION OF WATER)

Mr. William G. Bank, Division Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:

I herewith submit the annual report of the Bureau of Water Supply for the year ending December 31, 1933, covering the activities on the Pequannock Watershed, submitted by Mr. Thomas P. Byrnes, the activities in connection with the Transmission Lines and on Cedar Grove Reservoir, submitted by the undersigned and the activities of the Chemical Laboratory, submitted by Mr. J. F. D. Bauermann, Assistant Bacteriologist in Charge.

Respectfully submitted,

ALFRED B. ANDERSON,

ASSISTANT ENGINEER.

ANNUAL REPORT

OF THE

BUREAU OF WATER SUPPLY

(DIVISION OF WATER)

ANNUAL REPORT
OF THE
PEQUANNOCK WATERSHED

Mr. Alfred B. Anderson, Assistant Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:

The annual report of the activities on the Pequannock Watershed for the year ending December 31, 1933 is submitted herewith. The data up to and including October 1st, 1933 was obtained from the records of the late Thomas W. Reilly, my predecessor, who died on October 1st, after many years of faithful service to the City of Newark.

SANITATION

The usual stringent sanitary regulations were enforced. All garbage and other refuse was removed from both private and public property on the 63.7 square miles of watershed. The public rest areas were frequented by increased numbers of people. The method of conducting these areas and the general appearance of the city property was the occasion of much favorable comment.

RESERVOIRS AND STREAMS

The usual maintenance work of brush cleaning and flow-line cleaning was carried out. Two dams were removed in the Timberbrook section and in the Echo Lake section. The stone dam at Charlotteburg Pond was repaired.

CITY OWNED BUILDINGS

Several of the buildings were repaired and painted.

ROADS

Minor repairs were made on the roads at Charlotteburg and Macopin Village.

FIRE PROTECTION

The watershed is laid out in sections which are ably and efficiently patrolled. Fire lines have been established where needed. The result is that the fire hazard has been reduced to a minimum.

FORESTRY

An intelligent and farseeing policy of tree planting and silviculture is being carried out under the supervision of John Heilman the forester. This program will give the City of Newark one of the finest stands of timber in this section of the country.

CIVILIAN CONSERVATION CORPS CAMP

A camp of 200 C.C.C. boys was established on the watershed this year. These boys under able direction have accomplished work of inestimable value, notably around Clinton and Oak Ridge reservoirs.

CIVIL WORKS ADMINISTRATION EMPLOYEES

A crew of 600 C.W.A. workers were assigned to the watershed in December. They are doing splendid work of a constructive nature. Among other projects they have ditched and drained 100 acres of swamp land; laid the foundation for an incinerator and cleared several acres of land to make it available for tree planting in the spring.

WOOD JOBS

Several hundred feet of poles were cut and hauled to Cedar Grove and to places along the pipe line, also cord wood was cut and supplied to the intakes, offices, garages, etc.

SUMMARY

The general physical condition of the watershed property is excellent and the coordinated efforts of the employees tend to maintain a maximum of efficiency at a minimum cost.

Respectfully submitted,

THOMAS P. BYRNES

SUPERINTENDENT OF PEQUANNOCK WATERSHED

ANNUAL REPORT
ON THE
TRANSMISSION LINES
AND
CEDAR GROVE RESERVOIR

Mr. William G. Bank, Division Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:

TRANSMISSION LINES

During the year of 1933 the usual work necessary to maintain and operate the 62 miles of steel transmission pipe lines has continued.

A careful inspection is made each week of the entire system to locate any trouble that might cause damage to our supply. All air valves are operated and other valves inspected. In the course of this inspection any leaks in the pipe lines are reported.

The controlling valves at the following reservoirs have been reconditioned in the past year: Canistear Reservoir, Oak Ridge Reservoir, Clinton Reservoir, Macopin Intake and Cedar Grove Reservoir.

The mechanical equipment used in changing screens at Cedar Grove Reservoir was overhauled and repaired, the screens were reconditioned and the wells in the gate house were emptied and the gates inspected every six months.

MAINTENANCE OF RIGHT OF WAY

The two pipe line bridges were wire brushed and painted, small foot bridges were rebuilt, ditches and drains for surface water were cleaned and the grass along the pipe lines mowed during the summer months. It was necessary to build several small retaining walls along the side of the right of way to prevent erosion of the fill covering the pipe lines. In several locations, roadways were graded and kept in re-

pair to maintain an entrance to our pipe lines.

NEW CONSTRUCTION

Owing to the location of the new State Highway, Route 23, Section 13, at Smith Mills, Butler, it was necessary to relay in a new location approximately 650 feet of each of the 2 - 48-inch Pequannock conduits this year. This was done by Peter Scola, Inc. General Contractor, for the city and paid for by the State Highway Department at a cost of approximately \$27,200.

TREATMENT PLANT - MACOPIN

A new treatment plant was constructed at Macopin Intake to house the machines and pumps used in applying chlorine and ammonia to the water. In this plant provision has been made to handle chlorine in one (1) ton cylinders in place of 100 lb. cylinders. The cost of chlorine in 100 lb. cylinders f.o.b. Newark was five (5) cents per lb. and had to be hauled by department trucks 30 miles to Macopin Intake. The new price of chlorine in one (1) ton cylinders f.o.b. Charlotteburg (about 1-1/2 miles from Macopin) in carload lots is 2.37 cents per lb. Based on average yearly requirements the saving on 173,700 lbs. of chlorine will be \$4,578.31. This will more than pay for the new building the first year.

WOOD STAVE LINE

Considerable attention has been given to the 6400 feet of 48-inch wood stave pipe line built in 1925 at Macopin. Owing to the deteriorated condition of the wooden staves it is impossible to stop the leakage in this pipe. Although the leakage in this line flows into Macopin Intake and is not lost and in view of the fact that this line has paid for itself and has fulfilled the purpose for which it was built, it is recommended that this line be discontinued and dismantled as soon as possible.

CEDAR GROVE RESERVOIR

During the year of 1933 the usual work in maintaining the general appearance of the reservation has continued. The nursery started in 1932 was planted and cared for by the Cedar Grove employees augmented from time to time by men from the pipe line organization

and the Citizens Conservation Corps. During the year an irrigation system for the nursery was laid by the pipe line forces. This permitted the enlarging of the nursery so that 280,600 seedlings were planted and cultivated. 161,850 Norway Spruce and Red Pine were lifted and sent to the watershed for planting. 4,500 Scotch Pine were planted along Ridge Road to improve the appearance of the land cleared of brush by the C.C.C. organization. Other small groups of evergreens were planted throughout the reservation to improve the general appearance.

CIVIL WORKS ADMINISTRATION PROJECTS

Two C.W.A. Projects were started during the month of December. Approximately 15 acres in Cedar Grove is being cleared of brush and the land prepared for planting a nursery.

The second project is that of reconditioning the two Pequannock conduits from Bloomfield to Belleville Reservoir.

Both of these projects are progressing favorably at the present time and will be completed about May 1, 1934.

Respectfully submitted,

A.B.ANDERSON

ASSISTANT ENGINEER.

ANNUAL REPORT
OF
THE
CHEMICAL LABORATORY

Mr. Alfred B. Anderson, Assistant Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:

Submitted herewith is the annual report covering the activities of the Cedar Grove Laboratory, Division of Water for the year ending December 31, 1933.

The procedures of the American Public Health Association and the United States Public Health Service, supplemented by methods we find better adapted to our own supply were followed in the laboratory. The latter methods serve for the purpose of checking the former.

The following number of samples from the various sources were examined microscopical and bacteriological as in the past.

<u>Source</u>	<u>Microscopical</u>	<u>Bacteriological</u>
Station #1 & 2 Great Notch.	587	612
Station #3 Cedar Grove Reservoir Effluent.	293	299
Station #6 Belleville Reservoir Effluent.	1	282
Station #7 Wanaque at Belleville.	289	291
Station #8 So. Orange Ave. Reservoir Effluent.	---	274
Station #9 City Taps.	---	55
Station #16 Macopin Intake.	61	54
Station #17 Echo Lake Brook.	2	2
Station #20 Kanouse Brook.	50	50
Station #25 Clinton Brook.	52	51
Station #30 Oak Ridge Brook.	67	52
Station #18 Timber Brook.	2	---
Station #31 Davenport Brook.	---	1
Station #32 Wallace Brook.	---	1
Station #33 Oak Ridge Brook Coursen Road.	---	1
Pequannock River above Charlotteburg Pond.	2	---
New Distribution Lines in City.	---	34
Cedar Grove Reservoir Proper.	12	---
Special Samples.	12	29
TOTAL	1430	2088

MICROSCOPY

The detection of microorganisms in water is utilized for the express purpose of controlling those, that may affect its aesthetic quality, such as odor, taste and color.

Kanouse Brook had an abundance of algae about March 31st, that required copper sulphate treatment for four days to eliminate a purging that had been taking place.

On April 11th, Synura and Dinobryon appeared in Oak Ridge Stream, treatment was commenced immediately and continued until April 29th, when the addition of Copper Sulphate was no longer required.

As in the year previous, we were again troubled with Daphnia and Cyclops in our Cedar Grove Reservoir. In that the Crustacea are difficult to destroy it became necessary to treat the Reservoir on June 3rd, and again on June 8th, respectively with copper sulphate. The reservoir was again turned on June 9th.

Wallace Pond in the Oak Ridge Area of our watershed was treated at intervals in June and July for Synura and Algae.

About August 2nd, the Crustacea Bosmina appeared in Cedar Grove Reservoir, but did not require treatment and disappeared by August 15th.

A heavy runoff in the watershed on September 5th caused large numbers of Dinobryon, Daphnia, Anabaena and Anurea to come down Oak Ridge Brook. Treatment with copper sulphate was commenced at once and continued until September 15th, when treatment was discontinued.

BACTERIOLOGY

A complaint was received from a physician in the watershed on January 20th of a child being sick in the area near Oak Ridge Dam. Suspicion was that the child had typhoid fever. In conjunction with the City Board of Health of Newark an investigation was undertaken immediately. Samples of the water supply of the house were examined and found excellent. It was disclosed on our visit at the home that the child had visited at Moosepack Lake a short time previous and drank water in a cottage that had its water supply pumped from the lake. Widal tests were made of the entire family and of all those the girl had come in contact at Moosepack Lake. Precautions were taken about the home by the sanitary force at the watershed and everything was chlorinated. No positive evidence of typhoid could be found in the

tain a pH value of 7.5 at a short distance below Macopin Intake. On November 29th it was suggested that the treatment be discontinued as various combinations of chlorine and ammonia failed to arrest the increased bacterial growth since lime was added. Any further increase in chlorine at the time would affect the aesthetic quality of the water.

A complaint of dirty water being delivered to the City of Elizabeth on June 9th and June 10th was traced to an open gate of Pequannock water on Evergreen Avenue.

During September pH values of water in test holes in Port Newark area were made to note the corrosive action on the distribution system in that area.

On November 14th a complaint from the City Board of Health was received as in the previous year that our water contained Nitrites and free Ammonia. It was claimed that it was recent pollution. This was not true, but was due to the chemical reaction of Ammonia and Chlorine in our water of low temperature. This will occur each year during the winter months.

A resident of Hackensack Lake complained to the City Board of Health of chlorine taste in the water. It was recommended in Mr. Weston's report that a dechlorizer be placed at Wayne, N.J. A water safe bacteriologically cannot be delivered at Newark and still have it free from chlorine taste at all times in Wayne, N. J.

During the year nine samples were analyzed chemically for the Division of Water, two for the Bureau of Sewers, two for City of Elizabeth.

PURIFICATION - CHLORINATION

The Vacuum Feed Chlorine machines functioned effeciently as heretofor. With the purchase of a new ammoniator about August 1st, we are now in a position to resort to the chloramine treatment of the entire Pequannock supply being delivered to Newark.

Ortho-tolidine tests are made hourly on both pipe lines when in use at Macopin Intake to determine the chlorine residuals. These residuals were further checked at Great Notch.

The removal of grass from Oak Ridge brook in the fall of 1932 showed its results this year in that the water coming down Oak Ridge brook did not have its customary musty grassy odor so prevalent in the summer and fall of each year.

The draining and ditching of Copperas Pond in Timber Brook will greatly improve the quality of water from this area.

WANAQUE SUPPLY

Daily Bacteriological, Microscopical and Chlorine residuals were made daily of Wanaque water at Belleville as in year previous.

As in the past Wanaque supplied a water of excellent bacterial quality.

On May 10th, due to changes in the Wanaque System of distribution a water somewhat high in turbidity was supplied for a day. As we were informed of the change in their lines, we anticipated water of high turbidity.

Although Wanaque water has had a slight fishy odor toward the end of the year, physioally it is better than years previous. They have resorted to ammoniation as a means of dechlorinizing.

RECOMMENDATIONS AND CONCLUSION.

1. Oak Ridge Brook at Station #34 should have its banks lined with stone to check the erosive action of the water at this point. A series of rip raps would aid aeration.
2. Kanouse Brook should be cleaned and Grimshaw Pond drained. Bacteriologically this brook affords us most trouble. The effluent from Idylease Sanitorium should be chlorinated and their disposal plant improved as this place is a source of danger.
3. Installation of a chlorinator in South Orange Avenue Reservoir for use in the summer months.
4. Sending of all water delivered into Newark by way of Cedar Grove Reservoir.
5. The operation of the Chlorination plant at Macopin Intake has been under the laboratory supervision since 1925. It is hoped that it will remain as such, for it is the results obtained in the laboratory that control its operation.
6. As to low pH value of our water and lime treatment, a separate report will cover this.

Respectfully submitted,

J.F.D. BAUERMANN

ASSISTANT BACTERIOLOGIST IN CHARGE.

ANNUAL REPORT

OF THE

BUREAU OF DISTRIBUTION

(DIVISION OF WATER)

ANNUAL REPORT
OF THE
BUREAU OF DISTRIBUTION
(DIVISION OF WATER)

1933

Mr. William G. Bank, Division Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:

The annual report of the Bureau of Distribution for the year ending December 31, 1933 is submitted herewith; reports of the Bureau of Inspection and of the Meter Laboratory being embodied herein.

PRECIPITATION ON PEQUANNOCK WATERSHED

The precipitation on the Pequannock Watershed as determined from the average of observations at three (3) locations, Canistear Reservoir, Oak Ridge Reservoir and Charlotteburg, amounted to 54.20 inches for the year 1933. This is somewhat above normal and was occasioned by unusually heavy rainfall of more than 12 inches in August and of about 8 inches in September.

STORAGE AND DEPLETION - PEQUANNOCK RESERVOIRS

The Pequannock Reservoirs were practically full and overflowing from January 1, 1933 until June 17, 1933. From then they were drawn down gradually until the middle of August at which time the depletion amounted to about 1.2 billion gallons. The heavy rains of August again filled all reservoirs. They remained practically full from August 26th to October 14th and then again were gradually drawn down to about the midsummer levels by the end of the year.

WATER DIVERSION

A total of 12747.6 million gallons of water were diverted from the Pequannock Watershed during 1933 as contrasted with 14118.3 million gallons in 1932, a decrease of 1370.7

million gallons.

From Wanaque Reservoir, 5110.4 million gallons of water were taken by Newark in 1933 as compared with 4359.3 million gallons in 1932, an increase of 751.1 million gallons.

Month by month figures of the amount of the 1933 diversions are shown in the last two columns of Table No.1 of this report.

The Pequannock diversion figures differ from the figures of consumption of Pequannock water by the amount of the gain or loss in storage in Cedar Grove Reservoir. For the entire year 1933 there was a net loss of 28.2 million gallons in Cedar Grove Reservoir. The total consumption of Pequannock water therefore exceeded Pequannock diversion by this amount as seen in the next paragraph.

WATER CONSUMPTION

The total consumption of water in the Newark system for the year was 17886.2 million gallons, an average of 49.0 million gallons daily, a decrease of 556.8 million gallons or 1.4 million gallons daily, from the 1932 figures of 18443.0 million gallons and 50.4 million gallons daily. Of this, 12775.8 million gallons (35.0 million gallons daily) were from the Pequannock supply and 5110.4 million gallons (14.0 million gallons daily) from the Wanaque supply as compared with 14083.7 million gallons (38.5 million gallons daily) from the Pequannock in 1932 and 4359.3 million gallons (11.9 million gallons daily) from Wanaque in 1932.

Of the total 1933 consumption of 49.0 million gallons daily, 40.9 million gallons daily were consumed in Newark and 8.1 million gallons daily were delivered to other systems. For details see Tables No.1 and No.2 of this report.

During the year of 1933 it was necessary for the Bureau of Distribution to curtail all but necessary expenditures for construction and maintenance work over the system. Budget figures for the year were materially reduced because of the necessity for the utmost economy due to general business conditions throughout the country.

The following is a summary of the most important work accomplished by the Bureau of Distribution during the year:

Completion of all water main construction work necessary, incidental to construction of City Railway, Pennsylvania Station Improvements, Raymond Boulevard and partial completion

of State Highways. This work included both high and low pressure mains, the most important being those on River Street, Mulberry Street, Broad Street, Halsey Street, Washington Street, High Street and the lowering of the 36-inch cast iron No.5 line at Heller Parkway.

Sterilization of all new mains by means of a portable chlorinating machine.

Changing all record maps showing new layouts.

Construction of new 24-inch roundabout connection between the 60-inch steel line and the 24-inch cast iron feeder supplying the Heller Parkway regulators at Heller Parkway and Forest Hill Parkway (see Bureau of Engineering report).

New 20-inch gate valve insertion on crossover between No.1 and No.5 lines at Verona Avenue and Third Street.

Strengthened system on Frelinghuysen Avenue by new connection to distribution grid from 36-inch main at VanVechten Street.

Installation of new division gates in certain locations due to low pressures and insufficient main capacity.

Prepared schedule, estimates and report covering relaying large percentage of small mains with larger mains, new feeder extensions and new 60-inch steel supply main in Alexander Avenue between 60-inch Cedar Grove main and 48-42-inch Pequannock lines (see Bureau of Engineering report - ref. to Report #234 dated January 1933 of National Board of Fire Underwriters)

Bypassing, draining and cleaning of South Orange Avenue Reservoir. This work included pointing up masonry, painting and renewal of screen towers. After sterilization the reservoir was put back in service. This reservoir constituted a source of pollution not controlled fully by chloramine treatment at Macopin. Gas tubes occurred at each filling of the reservoir and relief by local treatment was only temporary. Upon recommendation of Mr. Bauermann, Bacteriologist, the reservoir was cleaned and immediate favorable results obtained which it is hoped will be permanent.

Flushed entire Cedar Grove and South Orange Avenue levels necessitated by dirty water condition (see Bureau of Engineering report)

Test holes, samples and chemical analysis to determine the extent of corrosion in cast iron feeders on Fort Street and on Doremus Avenue due to soil conditions, together with studies and estimates of cost on replacements.

Prepared schedule for inspection, reconditioning and necessary replacement of all

DISTRIBUTION SYSTEM

The total length of pipe owned by the city is now 531.41 miles in the low pressure system and 27.80 miles in the high pressure system. Connected with the mains in the low pressure system are 4,257 fire hydrants and 380 in the high pressure system; 7,996 gates control the flow of water in mains in the low pressure system and 252 gates in the high pressure system. There are 71,482 connections, known as services in the low pressure system, of which 55,381 are in use; through these water for domestic, commercial and public use is drawn. There are 300 connections in the high pressure system, of which 267 are in use. The average pressure in the low pressure system ranges from 30 to 140 pounds, and in the high pressure system from 100 to 160 pounds per square inch.

STREET MAIN EXTENSION, LOW PRESSURE SYSTEM

The total extension to street mains in the city during the year 1933 was as follows:

7,188 lineal feet = 1.361 miles of from 6" to 36" diameter.

The amount of work done in relaying was as follows:

4,474 lineal feet = 0.848 miles of from 8" to 48" diameter.

The amount of work done in lowering pipe was as follows:

968 lineal feet = 0.183 miles of 6" to 24" diameter.

The total amount of pipe of different diameters, deducting old pipe taken out and adding new pipe of larger size in place of the old pipe removed, consists of 2,805,860 lineal feet or 531.41 miles.

The number of low pressure taps made during the year was 95. Of these 37 were of 1-inch diameter, 10 of 1-1/2-inch, 23 of 2-inch, 5 of 3-inch, 7 of 4-inch and 13 of 6-inch diameter.

The total number of low pressure taps in the city at the end of the year 1933 was 71,482, while the number of taps in actual use was 55,381. The difference shows the services installed in advance of street pavements.

During the year 63 low pressure hydrants were set. Of these 39 were replacements of old hydrants, and 24 were additions to the number already in place; 14 hydrants were taken out

and not replaced, making the total number of hydrants in the low pressure system:

In the City.....	4,209
Silver Lake Section and Belleville....	<u>48</u>
Total.....	4,257

STREET MAIN EXTENSION, HIGH PRESSURE SYSTEM

The extension of high pressure mains during the year 1933 was as follows:

457 lineal feet = 0.086 miles of from 8" to 20" diameter.

Relaid 389 lineal feet = 0.074 miles of 12" diameter.

The total amount of high pressure pipe of different diameters on December 31, 1933 was as follows:

146,763 lineal feet = 27.80 miles.

The total number of high pressure taps in the city at the end of the year 1933 was 300, while the number of taps in actual use was 267. The difference shows the services installed in advance of street improvements.

During the year 2 high pressure hydrants were set, making a total of 380 high pressure hydrants in the City. The number of high pressure taps made during the year was 3.

During the year 1933, 12 breaks on mains were repaired and a total of 3159 leaks, covering mains, hydrants and services were investigated and when necessary repairs were made. Complaints of poor pressure investigated amounted to 1093. 394 services were cleaned out at the main and 875 new curb boxes set. A total of 676 hydrant repairs were made, this high percentage of the entire system being necessitated almost entirely by improper and unauthorized use.

Mr. Arthur R. Stemmler of the Bureau of Inspection reports the following work done during the year.

Monthly Meter Readings.....	8429
Meter Inspections.....	1289
Service Inspections.....	561
Special Investigations.....	4971
Mason and Building Inspections.....	690
Water Searches.....	131
Bypasses Sealed.....	45
Inspections on Unmetered Fire Services.....	1600
Surveys and Drawings.....	792

Twenty-two (22) Water Meters supplying other municipalities were read weekly. In addition to the above special efforts were made to locate cross connections between the City supply and private water systems. Seventeen (17) were found and removed by owners.

Mr. James Woolley of the Meter Laboratory reports that there were 57,444 meters of various makes in service on December 31, 1933 ranging in size from 1/2-inch to 16-inch. 3272 meters were removed to the Laboratory for repairs and testing. Of these 555 were found damaged by frost, 2096 were stuck, 176 were damaged by excessive heat and 445 were tested at the Laboratory. 1160 meters were tested or repaired and tested on the owners premises and special work totaling 5496 calls was attended to in the field.

Respectfully submitted,

ROBERT O. SCHOLZ
ENGINEER IN CHARGE

ARTHUR J. SIMPSON
ASSISTANT ENGINEER

TABLE I.
CONSUMPTION STATEMENT FOR YEAR ENDING DECEMBER 31, 1933.

1933						
MONTH	Total Consumption per Month, Million Gallons, Newark, Belleville, Bloomfield, Elizabeth, Nutley, Packanack and Wayne. Water also supplied to Elizabethtown Water Co. for part of Hillside.	Average Daily Consumption, Million Gallons, Newark and suburbs.	Total Consumption per Month, Million Gallons, Newark.	Average Daily Consumption, Million Gallons, Newark.	Average Temperature, Newark.	Rainfall - Inches - Newark.
January	1481.2	47.8	1226.3	39.6	39.7	2.46
February	1318.1	47.1	1115.5	39.8	33.5	4.94
March	1395.9	45.0	1193.9	38.5	37.3	8.01
April	1336.2	44.5	1131.5	37.7	51.8	5.22
May	1365.1	44.0	1126.1	36.3	64.5	5.62
June	1510.1	50.3	1248.9	41.6	71.7	4.44
July	1699.3	54.8	1426.8	46.0	75.4	2.54
August	1637.0	52.8	1361.7	43.9	73.9	7.70
September	1524.1	50.8	1262.2	42.1	68.5	9.23
October	1589.8	51.3	1330.5	42.9	55.3	1.59
November	1494.0	49.8	1242.8	41.4	39.5	1.84
December	1535.4	49.5	1274.3	41.1	31.6	5.14
Total	17836.2	587.7	14940.5	490.9	642.7	58.73
Average		49.0		40.9	53.6	4.89

Newark, Belleville, Bloomfield, Elizabeth, Nutley, Packanack and Wayne.
Water also supplied to Elizabethtown Water Company for part of Hillside.

Estimated population of Newark by Board of Health, December 31, 1933 - - 452,000.

Estimated population of Town of Belleville, Board of Health, December 31, 1933 - - 28,000.

TABLE II.
QUANTITIES OF WATER DELIVERED TO OTHER SYSTEMS

1933										
MONTH	Bellefonte	Bloomfield	Elizabeth	Elizabethtown Water Company	Nutley	Wayne	Packanack	Total	Received from Wanaque Supply	Quantities diverted from Pequannock Watershed
January	43.1	100.8	71.5	-.-	38.9	0.6		254.9	400.6	1070.1
February	39.1	73.6	64.9	1.1	23.3	0.6		202.6	267.3	1049.3
March	40.0	82.1	54.2	1.2	23.9	0.6		202.0	214.0	1195.4
April	42.6	80.3	55.6	1.3	24.1	0.6	0.2	204.7	211.7	1050.3
May	46.3	81.4	80.2	1.1	28.6	0.7	0.7	239.0	267.9	1149.2
June	48.0	83.9	100.9	1.5	25.3	0.8	0.8	261.2	448.6	1067.5
July	54.9	91.6	90.1	1.3	32.1	0.7	1.8	272.5	597.1	1092.7
August	52.9	93.1	92.6	1.3	31.2	1.7	2.5	275.3	620.2	1019.8
September	48.4	89.8	80.3	1.2	38.6	1.3	2.3	261.9	556.6	969.0
October	49.7	90.2	82.6	1.3	31.0	1.7	2.8	259.3	560.2	1052.1
November	50.7	91.2	77.3	1.1	27.6	1.7	1.6	251.2	526.6	945.4
December	53.8	92.6	80.8	1.3	28.5	1.5	2.6	261.1	439.6	1086.8
TOTAL	569.5	1050.6	931.0	13.7	353.1	12.5	15.3	2945.7	5110.4	12747.6

DIVISION OF WATER

SUMMARY OF STATISTICS OF THE NEWARK

NEW JERSEY, WATER WORKS

For Year Ending December 31, 1933.

Population by census, 1930.....	440,000
Date of construction.....	1889-1891
By whom owned.....	City of Newark
Source of Supply.....	Pegannock and the Wanaque Watersheds
Mode of Supply.....	Gravity

STATISTICS OF CONSUMPTION OF WATER

Population, City of Newark.....	452,000
Consumption for the year, City of Newark.....	14,940.5 m.g.
Consumption for the year, Town of Belleville.....	569.5 m.g.
Consumption for the year, Town of Bloomfield.....	1,050.6 m.g.
Consumption for the year, Town of Elizabeth.....	931.0 m.g.
Consumption for the year, Town of Nutley.....	353.1 m.g.
Consumption for the year, Township of Wayne.....	12.5 m.g.
Consumption for the year, Packanack Lake.....	15.3 m.g.
Consumption for the year, Elizabethtown Water Company.....	13.7 m.g.
Total Consumption for the year.....	17,836.2 m.g.

Passed through meters in the city.....	13,269.18 m.g.
Percentage of Consumption metered in the city.....	88.81 %
Average daily consumption, city and suburbs.....	49.0 m.g.
Average daily consumption in the city.....	40.9 m.g.
Gallons per day to each inhabitant in the city.....	90.48
Gallons per day to each tap in use in the city.....	738.52
Cost of supplying water per million gallons figured on total maintenance.....	\$72.70
Total cost of supplying water per million gallons figured on total maintenance, plus interest on bonds.....	\$133.50

STATISTICS REGARDING DISTRIBUTION SYSTEM

Mains, Low Water Pressure

Kind of pipe.....	Cast iron and steel
Size from.....	4-inch to 60-inch
Extended.....	7,188 feet during year
Discontinued.....	4,290 feet during year
Total now in use.....	531-2180/5,280 miles
Number of hydrants added during the year.....	63
Number of hydrants discontinued during the year.....	53
Number of public hydrants now in use.....	4,257
Number of stop gates added during the year.....	43
Number of stop gates now in use.....	7,996
Range of pressure on distributing mains.....	30 to 160 lbs.

Mains, High Pressure System

Kind of Pipe.....	Cast Iron
Sizes from.....	6-inch to 30-inch
Extended.....	457 feet during year
Total now in use.....	27-4203/5,280 miles
Number of hydrants added during the year.....	2
Number of public hydrants now in use.....	380
Number of stop gates added during the year.....	4
Number of stop gates now in use.....	252
Range of pressure on high pressure system	100 to 160 lbs.

Services, Low Pressure System

Kind of Pipe.....	Lead and cast iron
Sizes.....	5/8-inch to 6-inch
Total number of services in the City, January 1, 1933.....	71,475
Total number of services added during 1933 (5/8-inch to 6-inch diameter).....	95
Total number of services abandoned during 1933.....	88
Total number of services in the City, January 1, 1934.....	71,482
Total number of regular services in use January 1, 1934.....	54,630
Total number of regular services in use metered January 1, 1934.....	53,786
Total number of regular services in use unmetered January 1, 1934.....	844
Percentage of regular services in use metered January 1, 1934.....	98.45%
Total number of fire line services in use January 1, 1934.....	751
Total number of fire line services in use metered January 1, 1934.....	90
Total number of fire line services in use unmetered January 1, 1934.....	661
Percentage of fire line services in use metered January 1, 1934.....	12.0%

Connections, High Pressure System

Kind of pipe.....	Cast Iron
Sizes.....	1-1/2-inch to 6-inch
Number of connections added during the year.....	3
Number of connections in the city.....	300
Number of connections in use (1-1/2-inch to 6-inch).....	267
Number of meters added.....	1
Revised list of meters now in use.....	117
Percentage of connections in use metered.....	43.82%

ANNUAL REPORT

OF THE

BUREAU OF ENGINEERING

(DIVISION OF WATER)

ANNUAL REPORT
OF THE
BUREAU OF ENGINEERING
(DIVISION OF WATER)

Mr. William G. Bank, Division Engineer
Division of Water
Department of Public Affairs
Newark, New Jersey

Dear Sir:-

Following is a report of the work of the Bureau of Engineering for the year ending December 31, 1933.

PLANNING AND GENERAL DESIGN

Contract 31. Plans and specifications for replacing the two 48-inch Pequannock steel conduits for a distance of about 650 feet under State Highway Route 23, Section 13 in the vicinity of Smith Mills were prepared early in the year. Bids were received on February 9, 1933. The contract, designated as Contract 31, was awarded to Peter Scola and Son, Inc. of Glen Ridge, N.J., the lowest of 13 bidders, for \$22,180.

The 1300 feet of 48-inch riveted steel pipe in 30-foot courses was fabricated by the Pottstown Sotter Tank Works, Pottstown, Pa. Working drawings were checked, lines and grades were given and estimates were prepared. Work was completed in October. The amount of the final estimate was \$21,276.58. The total cost of the work including engineering, inspection and incidental work done by city forces was \$27,139.75 to be borne by the New Jersey State Highway Commission.

Aqueduct Studies. From time to time during the year studies and tests were made of carrying capacities of the various transmission lines of the Pequannock system. Two major deficiencies exist which must be overcome in the next few years before the water needs of the high portions of Newark increase appreciably. The first and most serious deficiency is in the 60-inch line from Cedar Grove Reservoir which at the present time can convey 47 million gallons daily to the city as compared with a requirement at times

in excess of 57 million gallons daily. The second deficiency is in the two Pequannock lines from Macopin to Cedar Grove Reservoir whose combined capacity without the aid of the wood-stave line is but 50 million gallons daily although the watershed as developed will safely yield 57 million gallons daily. The work of supplying additional capacity must be done within the next five years. It is believed that reconditioning of existing lines to a considerable extent will be possible and that a relatively small amount of new pipe will be required. This will furnish a low-cost solution of the problem of additional aqueduct capacities. A complete report on the subject recommending a definite program will be ready for presentation early in 1934.

Pipe Line Reconditioning. Studies of aqueduct-capacity needs had proceeded sufficiently far at the time of the inauguration of the Civil Works Administration program to show that another means of conveying water from Cedar Grove Reservoir was a part of any plan to provide additional capacity. The Pequannock pipe lines from Broad St., Bloomfield to Belleville, if cleaned and relined on the inside, could be made a part of such a means of conveyance. Such work seemed admirably adapted for C.W.A. prosecution because of the large amount of hand labor involved. Study was made of the equipment and material needs of the work and the details of labor requirements. Application submitted November 28, 1933 for C.W.A. Project 1631 to cover this work was approved. Work was started on December 13, 1933 and is now in progress.

Underwriter's Report. Report No. 234 of the National Board of Fire Underwriters on the City of Newark, field work for which was performed in the summer and fall of 1932, was issued in January 1933. The report summarizes the water-supply conditions as follows: Organization good and records generally complete. Supply adequate and consumption moderate. Pressure fair to good. Arterial system generally complete. Distribution system includes much small pipe in a generally complete but fairly wide gridiron. Gate valves in good condition with spacing good except upon large mains. Hydrants well spaced and maintained, but many have small connection with the mains. High pressure fire system provides valuable auxiliary protection in the area served.

The report recommends, as the minimum sizes of mains used for hydrant

supply, 8-inch for residential districts with 6-inch to be used only where completing a good gridiron and in no case in blocks 600 feet or more in length; and 8 and 12-inch for mercantile and manufacturing districts. Of sixteen (16) sections of recommended mains to strengthen the distribution system four have been contemplated for some time by the Division of Water, but their construction must await more favorable financial conditions; part of another has been completed in connection with State Highway Route 21 work; and several others are proposed for submittal as C.W.A. projects.

OPERATING STUDIES.

Water-Rate Increase. An increase in water rates was put into effect on October 1, 1933.

Several months of study were given to the subject. Various rate schedules were considered. A proposed ordinance embodying increases in fire-line charges to amounts considerably in excess of present figures but still to not immoderate amounts was opposed strongly by insurance interests and the Newark Chamber of Commerce and was withdrawn. By ordinance passed on September 19, 1933 rates were increased by the addition of a flat fifteen (15) percent surcharge for water used, charges for fire lines being excepted from any surcharge.

High Pressure System. A pitometer survey of the use from the high pressure fire system was made during the summer and fall of 1933. The system was subdivided into about twenty sections which were isolated one by one and continuous twenty-four-hour records of flow into each section were obtained. As a result of the investigations the amount of water used and lost from the high pressure system was reduced from about 1.5 million gallons daily to 0.5 million gallons daily. Part of the loss was through pressure regulator at Ferry and Fleming Ave. A large illegitimate use of high pressure water was also discovered and stopped.

Fire-Flow Tests. A fire-flow test of the low-pressure system in the vicinity of Mulberry Street and Raymond Boulevard was made in January. At the time, lines in Mulberry Street across Raymond Boulevard had not been reconnected. Tests made at the time of the Underwriters investigation in 1932 were so affected by City Railway construction work as to be valueless. The tests of January 1933 showed 6000 gallons per minute available as compared

with the Underwriter's requirements of 5500.

pH Control. The entire area of Newark supplied with Pequannock water experienced an unusually troublesome occurrence of dirty water in the spring of the year. An extensive and systematic flushing program covering a period of five (5) weeks was required to remedy the condition. The cause of the trouble probably was due to acidity of the water. Pequannock water changed gradually during the fall of 1932-3 from a neutral water (pH=7.0) to a water of considerable acidity (pH=6.3) in January 1933 and again in May. The acid water attacked rust deposits on the inside of the cast iron water mains causing these deposits to break down and in some cases to loosen, resulting in discolored water. The acid condition had passed by the time the dirty water situation had reached serious proportion. A routine of bi-weekly pH determinations was established to warn of a recurrence of the condition. Experiments were made in the fall of 1933 with lime-treatment to overcome acidity. Two chemical lime feeders were rented and installed at the head of the wood stave line. The application of lime lessened the effectiveness of chlorination and the experiments were discontinued. One machine was returned and the second is to be held on a rental basis. When the rental equals the cost of the machine, it will become the property of the City and will be available for use if the emergency of acid water again arises.

Wanaque Water into South Orange Avenue Reservoir Level. Studies were made for supplying Wanaque water at full available head to portions of the South Orange Avenue Reservoir Level in case of necessity occasioned by shut-down of the 60-inch Cedar Grove Line and the impossibility of supplying needs of Cedar Grove Reservoir Level and of South Orange Avenue Reservoir Level from Pequannock Supply via Great Notch and Belleville Reservoir.

One method for so doing was provided in December of this year by the installation of a 24-inch roundabout connection from the existing double-gated branch off the 60-inch steel line into the 24-inch line supplying the Heller Parkway Regulators.

RECORDS

Distribution System Maps. Tracings of all pages of the ten (10) books of the low pressure distribution system on sheets 11" x 17" were prepared during the year. Blue prints of each were issued to all men responsible for the operation of gates and hydrants. Changes and additions are made as they occur and new prints are issued.

Valve Drawings. Detailed drawings on tracing cloth of 8, 12, 16, 24, 30, 36 and 48-inch Newark Standard valves, of 3, 4 and 6-inch by-pass valves for same, and of 6, 8 and 12-inch Newark High Pressure valves have been practically completed during the year. Drawings of several valves remain to be done.

Water Statistics. Records of water consumption, rainfall, run-off and storage on the Pequannock and Wanaque Watersheds; temperatures of water at various points and results of Bacteriological examinations of water at principal operating points are received daily and compiled in the office. Observations of pH values of water at a large number of locations throughout the Newark system, taken twice a month and reports of weekly flushing operations and conditions of the water in the vicinity of about a dozen laundries are also received regularly and compiled.

Correspondence, Catalogues, etc. Correspondence, catalogue and plan files are now in such shape that matter can be found with little delay.

COSTS

Budget. Budget for the Division of Water for the year 1934 was prepared late in 1933. Seven charts showing the details of the organization and one large chart embodying them all were made.

Financial Control. As monthly financial statements are submitted by the accounting division the receipts and various items of expenditures are plotted month by month against corresponding figures for the previous year and against estimated figures in accordance with the Budget. A close control of financial affairs is thereby maintained.

PHOTO LABORATORY

The work done in the photographic laboratory during the year 1933 was again in excess of any previous year. Priced at rates charged by commercial studios the value of blue-prints, photostats and photographs made was \$10,250. Of this less than \$1200 was for work done for the Division of Water, which bears the entire expense of the laboratory. One third of the work done was for the Transit Bureau for City Railway. Work for the Department of Revenue and Finance totaled \$1800.

A new photostat machine must be purchased very soon. Its cost will probably be in excess of \$1000. Other equipment is in good condition.

Respectfully submitted,

JAMES E. GARRATT

DESIGNING ENGINEER.